MA-XRF imaging for the evaluation of early photographs

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MA-XRF has demonstrated great utility as a method for examining paintings and other pigmented surfaces [1-3], but very few examples of MA-XRF applications for photographic materials have been published [4,5]. By contrast, point X-ray fluorescence (XRF) is a well-established method for examining photographs [6-8]. However, it can be difficult to discern how elemental composition relates to image density by measurements performed at single points [9-11]. In addition, the small amount of image material in photographic materials means that the XRF signal, even from important heavy elements, may be relatively weak, adding to the challenge of interpretation [6].

Are the spatial information and large number of measurements inherent to MA-XRF sufficient to improve upon point XRF analysis of photographs? In this work, we evaluate laboratory-based MA-XRF imaging as a method for the non-invasive analysis of materials in 19th- and 20th-century photographs. Advantages and limitations of the technique will be discussed in the context of measurements from prints in the collection of The Metropolitan Museum of Art. Objects discussed will include examples of platinum prints, developed by different methods; gum bichromate over platinum; and salted paper prints.

In particular, a case study of platinum prints by Joseph T. Keiley, pioneer of the glycerine-development process [12], will be highlighted. Instead of using a developer bath, the Stieglitz-Keiley glycerin process involved saturating the exposed print with glycerine and applying a developer mixed with glycerine to the print with a brush, offering the photographer greater control. The image color could be shifted to a warmer sepia tonality, either overall or locally, by adding mercuric chloride to the developer. We will explore to what degree MA-XRF can distinguish differences between Keiley's experimental platinum prints.

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